

Appendix B: Vulnerability Assessment

A. HISTORY

Knightdale is one of twelve municipalities located within Wake County, North Carolina. It was named after Mr. Henry Haywood Knight, a prominent resident of the area who donated land to the Norfolk and Southern Railroad Company in order to bring a railroad to the crossroads near his property. The railroad was constructed shortly after 1904, and economic activity increased as a result. The Town received its articles of official incorporation from the North Carolina Legislature on March 9, 1927. Growth was slow until the 1960s when new businesses began to locate along US64. The widening of US64 in the 1970s, along with the growth of the Research Triangle region, accelerated Knightdale's population growth. With the more recent completion of the US64 Bypass and the extension of Interstate 540, Knightdale is currently the 4th fastest growing municipality in the state and by internal estimates has passed the threshold of 10,000 in total population.

B. GEOGRAPHY

Knightdale is located approximately six miles east of downtown Raleigh. The historic town center of Knightdale is situated on the ridge between the Neuse River and Buffalo Creek. Mingo Creek and major portions of Mark's Creek, Poplar Creek, and Beaver Dam Creek are within the current jurisdiction of the Town. The Corporate Limits currently contain 6.19 square miles. The area of the Town's ETJ includes an additional 14.77 square miles to make the total area under Knightdale's current jurisdiction 20.96 square miles.

C. SOILS

The soils within the Knightdale planning area are primarily of the Cecil and Wedowee classifications. The Cecil class is found mainly within the western area of Knightdale, while the Wedowee class is predominant in the central and eastern parts of town. According to Natural Resource Conservation Data soil descriptions, Cecil and Wedowee soils consist of very deep, well drained moderately permeable soils on ridges and side slopes of the Piedmont uplands. Slope is dominantly less than 25 percent but ranges from 0 to 60 percent.



D. POPULATION TRENDS

Population within Knightdale has been increasing at a considerable rate over the past 40 years according to US Census Data. The population for the Town (Corporate Limits only) has increased as shown on the following page.

Table B-1 - Town of Knightdale (Corporate Limits)

Population Data, 1960-2007

Year	Population	Increase from Previous Count	% Increase from Previous Count
1960 Census	622	-	-
1970 Census	815	193	31.0%
1980 Census	985	170	20.9%
1990 Census	1884	899	91.3%
2000 Census	5958	4074	216.2%
2007 Official State Estimate	9813	3855	64.7%

Although Census reports do not have population counts explicitly for the ETJ of Knightdale; use of housing unit, vacancy rate and average household size data suggest that the population of the Town's current ETJ is estimated to be 2,662. This brings the population within the current jurisdiction of Knightdale to approximately 12,475. Between 1990 and 2007, Knightdale's population (within the corporate limits) has increased from 1,884 to 9,813, an average annual population growth of 10.35%. Since an ample supply of potable water and sewage treatment are available due to the recent merger of the Town's systems with the City of Raleigh, the Town expects the population to continue growing at a rate of approximately 7-8% through 2025.

E. CURRENT DEVELOPMENT

The Wake County Property Appraiser's office prepared a report detailing current development and zoning within Knightdale's ETJ. The report, dated November 13, 2003, contained type and use, zoning, property values, parcel acreages,



commercial building square footages, residential building values, and commercial building values for all of the 3,931 parcels currently under the Town's jurisdiction.

Over half of the land within the Town's jurisdiction is currently classified as vacant. Of developed properties, the tax values are broken down into 67% residential and 33% commercial according to the most recent reports from the Wake County Department of Revenue. The following table shows land use data for all property within the ETJ.

Table B-2 - Land Use within Knightdale's Jurisdiction

Type of Development	Number of Parcels	Acreage	Percentage of Total
Single Family Residential	4,603	3,223	24.0%
Multi-family Residential	25	100	0.7%
Mobile Home Parks	12	163	1.2%
Total Residential	4,640	3,486	25.9%
Public Right-of-Way	n/a	1,260	9.4%
Vacant / Farm	1,283	6,702	50.0%
Commercial	175	441	3.3%
Industrial	7	590	4.4%
Public / Institutional	111	789	5.9%
Other	12	147	1.1%
Total	6,228	13,415	100%

Almost 70% of land within the Town's jurisdiction is zoned for residential use. The following table shows current zoning for all properties within the Town's ETJ.

Table B-3 - Zoning within Knightdale's Jurisdiction

Zoning	Number of Parcels Or Parcel Portions Due to Split Zoning	Acreage	Percentage of Total
RR-1	200	842	6.9%
GR-3	1,679	3,130	25.8%
GR-8	3,563	3,483	28.7%
UR-12	328	935	7.7%
Total Residential	5,770	8,390	69.1%



RMX	137	764	6.3%
NMX	194	768	6.3%
TC	32	21	0.2%
Total Mixed Use	363	1,553	12.8%
HB	221	727	6.0%
MI	43	1,002	8.2%
OSP	134	479	3.9%
Totals Less Right-of-Way	6,531	12,155	100%

Zoning categories RR-1 (Rural Residential), GR-3 (General Residential), GR-8 (General Residential) and UR-12 (Urban Residential) are exclusively residential. Zoning categories RMX (Residential Mixed Use), NMX (Neighborhood Mixed Use) and TC (Town Center) are mixed use zones that may contain a combination of residential, office and business uses. The three (3) zoning classifications for non-residential development are HB (Highway Business), MI (Manufacturing & Industrial) and OSP (Open Space Preserve).

F. WATER RESOURCES AND SANITARY SEWER SERVICE

On May 1, 2006, the Town of Knightdale merged its water and sewer systems with the City of Raleigh. Falls Lake is the drinking water supply for the City of Raleigh with a capacity of 100 million gallons per day (mgd) allocated for drinking water. The City of Raleigh is the sole entity that is permitted to use Falls Lake water for drinking water.

The City of Raleigh Public Utilities Department provides water and sanitary sewer service to over 167,000 metered customers and a service population of approximately 410,000 people in Raleigh, Garner, Wake Forest, Rolesville, Knightdale, Wendell and Zebulon areas. The Department is also developing its reuse water system to provide an alternative water resource for demands not requiring potable water quality.

The City of Raleigh owns and operates the water and sanitary sewer systems in the Town of Knightdale. The water system consists of supply, treatment, storage and transmission facilities and currently serves approximately 4,000 customers.

The sanitary sewer system consists of two interceptor lines, Mingo Creek and Beaverdam Creek. The sanitary sewer system also includes 11 pump stations: Hodge Road, Lockhart School, Pebblebrook, Square D, Kelly's Wil-Ros, Flowers



Street, Faison Drive, Harper Street, Langston Ridge, Riverview Commons and Poplar Creek Village. Septic tanks within Knightdale's ETJ are permitted by the Wake County Department of Public Health. Current Town policy discourages septic tank use for new construction.

G. CRITICAL FACILITIES

The Town of Knightdale has many facilities that have been designated as critical. Some of the critical facilities are necessary for daily operations of the Town and health and safety of the public. Others are designated as critical because significant damage or total destruction of the facilities would result in significant, possibly long-term impacts to the Town's residents or the environment.

The health and safety of the public is the highest priority during disaster situations, and the ability of Police, Fire, EMS, and Public Works employees to perform their duties is vital. According to the Town of Knightdale Emergency Response Plan, emergency response workers are typically housed in one (1) of four (4) facilities: Town Hall, the Public Safety Center, the Public Works facility, and Wellington Nursing Home. These locations are among the most critical.

Critical infrastructure is of high priority. Evacuation routes must be kept open, and town streets must be passable as soon as possible following a disaster to allow for quick response by the emergency team. An adequate potable water supply is necessary for public health and safety. Sanitary sewer pump stations are designated as critical because their failure could result in the significant release of raw sewage and subsequent impacts to adjacent waterways. The water booster pump station and all the sanitary sewer lift stations have emergency generators to supply electrical power in case of a power outage. These generators are maintained by the City of Raleigh Public Utilities Department.

County buildings, to include the East Wake Library and five schools, are designated as critical because of the long-term impacts that significant damage or destruction could have on the community.

Nursing homes and day cares are designated as critical because of the special evacuation procedures necessary for elderly residents and children. In addition, the Wellington Nursing Home serves as a housing facility for emergency



response workers. These facilities are all privately owned. Current values for the structures are included in Table B-6 below.

A survey of National Register of Historic Places data showed that four properties within Knightdale's jurisdiction are listed on the Register. These properties are designated as critical because of their historical significance. These properties are privately owned. Current values for the structures are included in Table B-6 below.

The table below gives each facility name and location as well as current or proposed replacement cost and comments. Number of people associated with the critical facilities, both public and private, appears in Table B-6, Vulnerability to All Hazards, Current and Future Conditions.

Table B-4 - Critical Facilities

Name	Location	Replacement Cost¹	Comment
Public Safety & Town Facilities			
Public Safety Center	967 Steeple Square Court	\$1,286,337	Emergency Shelter; Housing for Emergency Response Workers; equipped with generators
Town Hall	950 Steeple Square Court	\$2,051,557	Equipped with generators; Housing for Emergency response workers
Public Works Facility	306 Robertson Street	\$332,994	Housing for Emergency response workers
Recreation Center	101 Lawson Ridge Road		Possible location for staging and distribution of supplies



Name	Location	Replacement Cost ¹	Comment
Infrastructure			
500,000 gallon water tank	7429 Knightdale Blvd.	\$1,500,000 ²	
1,000,000 gallon water tank	7429 Knightdale Blvd.	\$3,000,000 ²	
Water booster pump station	Knightdale Blvd.	\$500,000 ²	Equipped w/ emergency generators and SCADA system
Water booster pump station	Forestville Road	\$500,000 ²	Equipped with emergency generators and SCADA system
Existing sanitary sewer pump stations	See above section	\$1,500,000 ²	All equipped with emergency generators
Proposed sanitary sewer pump stations	See above section	\$500,000 ²	All will be equipped w/ emergency generators and SCADA system
Knightdale Blvd.			Evacuation route
US 64/264 Bypass			Evacuation route
Interstate 540			Evacuation route
Town-owned Streets			Approx. 41.7 miles
County Facilities			
East Wake Library	946 Steeple Square Court	\$2,471,472	
Forestville Road Elem. School	100 Lawson Ridge Road	\$15,920,627	
Hodge Road Elem. School	2128 Mingo Bluff	\$10,557,663	
Knightdale Elem. School	109 Ridge Street	\$10,554,481	
Lockhart Elem. School	1320 Smithfield Road	\$9,711,653	
Knightdale High School	Forestville Road	\$33,000,000 ³	Emergency shelter



Name	Location	Replacement Cost¹	Comment
Nursing Homes			
Wellington Nursing Home	1000 Tandal Place	\$3,125,354	Possible Housing for Emergency Response workers
Day Cares			
Angelica's Childcare Center	1305 Oak Crest Drive	\$236,640	
Cora's Caring Hands	106 Thomas Place	\$113,690	
Forestville Elementary Before/After School Care	100 Lawson Ridge Road	\$15,920,627	
Grace's 1,2,3 Child Care	304 Aquamarine Lane	\$99,576	
Grow-N-Learn Child Care Center	1002 Mulford Court	\$1,197,785	
Jenette's Quality Care	111 Satterwhite Dr.	\$96,420	
Kid's Palace Home Child Care	942 Widewaters Parkway	\$274,069	
Kids Educational Center IV, Inc.	7106 Forestville Road	\$634,351	
La Bella Papillon Academy, LLC	7114 Knightdale Blvd., Suite A	\$638,234	
Little People Daycare	902 Widewaters Parkway	\$179,675	
Lockhart Elementary Before and After School Program	1320 N. Smithfield Road	\$9,711,653	
Ma Ma Jo's Day Care	301 Park Avenue	\$134,580	
Kids Education Center Inc.	4605 Old Faison Rd.	\$494,280	
Cathy Lee Day Care	529 Bethlehem Road	\$601,142	
The Growing Child Unlimited, Inc.	1005 Big Oak Court	\$1,853,948	
Kindercare Learning Center #814	200 Forest Drive	\$688,831	



Name	Location	Replacement Cost ¹	Comment
Historical Properties			
N.G. House Store	221 N. First Avenue	\$194,279	
Henry H. Knight Farm	7045 Knightdale Blvd.	\$204,558	
Midway Plantation	1900 Amethyst Ridge Drive	\$419,686	
Beaver Dam Plantation	7081 Forestville Road	\$139,299	

Notes:

¹ Actual property tax values obtained from Wake County Revenue Department, 12/31/08, unless otherwise noted

² Replacement costs obtained from City of Raleigh Public Utilities Department

³ Estimated construction costs from Wake County Board of Education

In addition to the critical facilities listed above, the Town of Knightdale owns the following vehicles that are used by its Emergency Response team.

Table B-5 - Emergency Vehicles

Department	Vehicle Type	Quantity	Replacement Cost
Fire	Engine 131	1	\$325,000
Fire	Engine 132	1	\$375,000
Fire	Engine 134	1	\$325,000
Fire	Truck 135	1	\$700,000
Fire	Pickup Truck 138	1	\$28,000
Fire	Jeep C-130	1	\$22,000
Police	Sport Utility	4	\$160,000
Police	Patrol Vehicle	16	\$560,000
Police	Unmarked Cars	6	\$210,000

H. REPETITIVE LOSS STRUCTURES

One indicator of the vulnerability of a community is the number of structures that have suffered damage repeatedly due to natural hazards. FEMA defines repetitive loss structures as properties for which two or more flood insurance



claims of at least \$1,000 each have been paid within any 10-year period since 1978. The Town of Knightdale requested Repetitive Loss Data from NCEM and was informed that there were no properties which were classified as repetitive loss structures in the Town's jurisdiction.

I. FUTURE DEVELOPMENT TRENDS

Historically, development in Knightdale has been rural in nature, with low densities and limited commercial and industrial activity. A change in the development trend in Knightdale has already occurred. From 2007 to 2008, the tax base for the Town has changed from 76% residential and 24% commercial to 67% residential and 33% commercial. Despite the sluggish housing economy there are still several large tract residential subdivisions still under way; however, the majority of development in Knightdale has shifted to commercial, medical office and apartment projects to serve the population which has already grown to a significant level. According to Planning Department staff, the trend toward non-residential development is expected to continue in the short term while single-family residential is expected pick back up within the next 3-5 years. Though subject to minor changes through the process of rezoning, current zoning data is the best indicator of the type of development the Town will experience in the future. With the adoption of the Town's new Unified Development Ordinance, the Town's jurisdiction has been proactively zoned to reflect the desired build out suggested by the 2027 Comprehensive Plan. Nearly 70% of the land in Knightdale's jurisdiction is currently zoned for residential development. As a result, future development is predicted to be predominantly residential; however non-residential property values are targeted by the Town Council and Town staff to reach 40% of the Town's future tax base.

J. SCHEDULED INFRASTRUCTURE AREAS

Future development within Knightdale will continue be spurred by the completion of several infrastructure projects recently completed or currently underway. These include transportation, water, and wastewater projects.

Of all the recent and proposed infrastructure projects, the two that have had the greatest impact on development within Knightdale's jurisdiction are transportation projects. The US64/264 Bypass serves Raleigh, Knightdale, and Wendell and connects US 64 and 264 to the Raleigh I-440 Beltline. Completion of



the Bypass has removed a considerable volume of through traffic from Business US64/Knightdale Blvd. and allowed Business US64 to function as a local arterial rather than a regional highway. The Eastern Wake Expressway (I-540) or Raleigh Outer Loop runs perpendicular to the US64/264 Bypass with two interchanges in Knightdale's planning jurisdiction as well as part of a future third interchange. It provides easier access from Knightdale to Durham, Raleigh-Durham International Airport and Research Triangle Park, making Knightdale more attractive to developers seeking land for commercial, residential, and industrial projects.

The Town will continue to discourage development relying on the use of septic tanks; however, construction of sanitary sewer lift stations and extension of sewer outfalls and waterlines will allow for new development. Recently completed water projects have included a second feeder line from the City of Raleigh and booster pump station along Forestville Road, as well as the completion of a water main loop connecting Old Faison, Bethlehem, Old Ferrell and Smithfield roads. Sanitary sewer projects include outfall lines along Beaver Dam and Poplar creeks as well as pump stations along Poole Road at Clark's Branch and the Neuse River.

K. VULNERABILITY TO ALL HAZARDS

Of the five (5) hazards identified during the hazard analysis, four (4) are non-geographic in nature. Hurricanes/Coastal Storms, Drought/Heat Wave and Severe Winter Weather have the potential to affect the entire Town while tornadoes/severe thunderstorms would impact smaller, yet not geographically predictable areas. Only flooding can be geographically defined.

The following table shows the community's vulnerability to all hazards with regards to property and people. The current values are based on Wake County's type and use data for existing development. Projected values are based on draft data compiled by CAMPO's Triangle Regional Model for buildout in the year 2030. Projected non-residential building and values are impossible to determine and have been intentionally left blank.



Table B-6 - Vulnerability to All Hazards, Current and Future Projections

Type of Development	Current Number of Buildings¹	Current Value¹	Current Number of People²	Projected Number of Buildings³	Projected Value⁴	Projected Number of People⁵
Undeveloped	1,283 parcels with 1,248 buildings	(\$333,685,336) (land value) \$21,833,434 bldg value	N/A			
Single-Family Residential	4,618	\$587,105,266	12,475	24,859	\$3,157,093,000	67,119
Multi-Family Residential	92	\$48,421,711	1,500			
Commercial	217	\$156,194,995	2,575			8,509
Industrial	18	\$10,859,881	125			
Other (includes Mobile Home Parks)	20	\$2,667,713	500			
Public & Institutional	125	\$75,679,551	5,200			
Total⁶	6,338	\$902,762,551	22,375	24,859	\$3,157,093,000	75,628

Notes:

¹ Parcel data and actual property tax values obtained from Wake County Property Appraiser's office, 12/31/08.

² Population figures assume 2.7 persons per household for single-family and 1.9 persons per household for multi-family. These were the average household sizes according to the 2000 U.S. Census. -Numbers for major commercial and industrial employers estimated from County Business Patterns by Zip Code. Numbers for public facilities from Town and Wake County records.

³ Projected number of housing units (combines single-family and multi-family units) from CAMPO's Triangle Regional Model draft for 2030.

⁴ Projected value assumes structure value of \$127,000 for all new residences. This is the current average residential structure cost.

⁵ Projected residential population and projected number of employees (includes all business types) from CAMPO's Triangle Regional Model draft for 2030.

⁶ Total does not include data for undeveloped properties.



L. VULNERABILITY TO FLOODING

Flooding is the only hazard addressed in the plan whose impacts can be defined geographically. Mitigation strategies to restrict development in these geographical areas can be very effective tools in preventing natural hazards from having disastrous effects. The Town of Knightdale participates in the National Flood Insurance Program. As a result, Flood Insurance Rate Maps (FIRMs) are available. These maps indicate areas that would be expected to flood during a 100-year storm. According to FIRM maps for Wake County dated May 2, 2006 832.7 acres within Knightdale's jurisdiction lies within the floodplain. This is approximately six percent (6%) of the Town's jurisdiction.

To date, little development has occurred in flood hazard areas within Knightdale's jurisdiction, and this is substantiated by the lack of repetitive loss structures as noted above. As upland property becomes scarce, development within areas more prone to flooding may appear attractive, but Town ordinances and policies have been established to restrict development within floodplains. The existing Town ordinances related to development are described in Appendix C – Community Capability Assessment. Future vulnerability to flooding is not expected to increase significantly due to restrictive development ordinances in flood prone areas.

The following table shows the community's vulnerability to flooding with regards to property and people. The current values are based on Wake County's type and use data for existing development. The data in the table reflects all properties that are affected by the floodplain, although the existing structures on these properties may or may not be built within the floodplain. Existing floodplain and development ordinances do not permit construction in the flood hazard areas unless the structure exceeds the Base Flood Elevation (BFE) by a minimum of two (2) feet. Therefore, the projected values assume that no development will occur in areas susceptible to flooding.



Table B-7 - Vulnerability to Flooding, Current and Future Projections

Type of Development	Current Number of Buildings¹	Current Value¹	Current Number of People²	Projected Number of Buildings³	Projected Value⁴	Projected Number of People⁵
Undeveloped	98 parcels with 19 structures	(\$82,150,613) (land value) \$1,262,360 bldg value	N/A			
Single-Family Residential	165	\$23,224,071	445 ⁵	0	0	0
Multi-Family Residential	36	\$14,591,989	550 ⁵	0	0	0
Commercial	1	\$86,010	5	0	0	0
Industrial	2	\$1,221,151	50	0	0	0
Other (includes Mobile Home Parks)	5	\$1,499,837	250	0	0	0
Public / Institutional	7	\$20,503,490	2,550	0	0	0
Total⁶	216	\$61,126,548	3,850	0	0	0

Notes:

¹ Parcel data and actual property tax values obtained from Wake County Property Appraiser's office, 12/31/08.

² Numbers for major commercial and industrial employers estimated from County Business Patterns by Zip Code. Numbers for public facilities from Town and Wake County records.

³ Projections assume full development according to current zoning and include data for any projects currently approved by Planning Department.

⁴ Projected value assumes structure value of \$127,000 for all new residences. This is the current average residential structure cost.

⁵ Projected population figures assume 2.7 persons per household for single-family and 1.9 persons per household for multi-family. These were the average household sizes according to the 2000 U.S. Census.

⁶ Total does not include data for undeveloped properties.



M. MAPPING

An important part of the vulnerability assessment was the preparation of maps to show current conditions, future development conditions, critical facilities, and hazard areas. Six (6) maps were produced in order to show current and future vulnerability for the Town.

Map B-1, Base Map, shows the current ETJ and Town limits, major roads, the Neuse River, and existing development.

Map B-2, Critical Facilities Map, adds all public safety, critical infrastructure, and county-owned buildings to the Base Map.

Map B-3, All Hazards Map, adds floodplain data from Wake County FIRM Maps dated May 2, 2006, to the Base Map. Hurricanes/coastal storms, drought/heat wave, tornadoes/severe thunderstorms and severe winter weather are not depicted on the map because they are not geographically defined.

Map B-4, Current Vulnerability Map, combines the Critical Facilities Map with the All Hazards Map.

Map B-5, Current Zoning Map, shows the current zoning within the Town of Knightdale's jurisdiction.

Map B-6, Future Vulnerability Map, combines the Current Zoning Map with the critical facilities data and the floodplain data.

